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# EPA Superfund
# Record of Decision:

**ABERDEEN PROVING GROUND (EDGEWOOD AREA)**
**EPA ID: MD2210020036**
**OU 07**
**EDGEWOOD, MD**
**09/27/1996**

<IMG SRC 0396228>

# J-FIELD SOIL OPERABLE UNIT
# RECORD OF DECISION

FINAL DOCUMENT

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1838-A-1

Edgewood Area - Aberdeen Proving Ground, Maryland

September 1996

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## 1.0 DECLARATION OF THE RECORD OF DECISION

### 1.1 SITE NAME AND LOCATION

J-Field Soil Operable Unit (SOU), J-Field, Edgewood Area, Aberdeen Proving Ground (APG). Maryland. This Operable Unit (OU) consists of two main burn pits (the Northern Main Burn Pit and Southern Main Pit). It also includes the Pushout Area, which consists of the O-ethyl-S-(2-iisopropylaminoacetyl)methyl phosphonothiolate (VX) Burn Pit, the Mustard Burn Pit, and the Liquid Smoke Disposal Pit.

### 1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) document presents the selected remedial actions to reduce the risk posed by contaminated surface soils from the J-Field SOU located at J-Field, APG, Maryland. The remedial actions were developed in accordance with the Comprehensive Environmental Response. Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) OF 1986 and to the extent practicable the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site. Documents contained in the administrative record are identified in Section 2.2.2.

The U.S. Environmental Protection Agency (USEPA) and the Maryland Department of Environment (MDE) concur on the selected remedy.

### 1.3 ASSESSMENT OF THE SITE

Actual or potential releases of hazardous substance from this site if not addressed by implementing the response actions selected in this ROD may present an imminent and substantial endangerment to public health, welfare or the environment.

### 1.4 DESCRIPTION OF THE SELECTED REMEDIES

The remediation of the J-Field SOU is part of a comprehensive environment investigation and clean-up action currently being performed at APG under the CERCLA program. APG is divided into 13 study areas which encompass potential sources of contamination. The J-Field Study Area is comprised of 2 OUs, one of which is the soil contamination at the J-Field SOU. The remaining areas of concern at J-Field are included as part of the other OU, which is being addressed as a separate action. This decision document addresses the actions to be taken toward remediating the principal threats provided by high levels of arsenic, lead, and PCBs at the J-Field SOU: (1) the removal of isolated hot spots of contamination from the SOU followed by (2) the construction of a Protective Soil Blanket (PSB) over the J-Field SOU. The major components of the selected remedy will include:

! Unexploded Ordnance (UXO) clearance:

! Site preparation and vegetative clearance:

! Excavation of isolated areas of arsenic, lead and PCB contamination from the Northern and Southern Main Burn Pits and lead from the Pushout Area, is described below. The contaminated soil will be transported off-site for treatment and disposal:

! Placement of a layer of permeable geotextile fabric over the entire surface of the J-Field SOU to separate the unexcavated soil from clean soil:

! The addition of a minimum two feet thick PSB of clean soil to the J-Field SOU. Where needed, additional soil will be added to raise topography above the 100 year flood plain level.

! Placement of shoreline protection along the Chesapeake Bay side of J-Field to prevent erosion of the J-Field SOU;

! Repairs of any road damage that may occur during the remediation effort: and

! Institution of a long-term performance monitoring program which will be done as part of the first remediation:

### 1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action and is cost-effective. The remedy utilizes permanent solutions and currently available technologies to the maximum extent practicable. The limited excavation placement of a PSB and off-site transport and disposal reduces the risks associated with the contaminants by removing, treating or disposing of them as necessary. The statutory preference for treatment or resource recovery is satisfied by using the selected remedy because the principal element of the remedial technology is to reduce permanently and significantly the toxicity, mobility or volume of hazardous substances at the J-Field SOU.

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## 2.0 DECISION SUMMARY

## 2.1 SITE NAME, LOCATION, AND DESCRIPTION

APG is a 72,500-acre Army installation located in southeastern Baltimore County and southern Harford County, Maryland, on the western shore of the upper Chesapeake Bay (Figure 1). The installation is bordered to the east and south by the Chesapeake Bay; to the west by Gunpowder Falls State Park the Crane Power Plant and residential areas: and to the north by the towns of Edgewood, Magnolia, Perryman, and Aberdeen. APG is divided into two areas by the Bush River: the Edgewood Area lies to the west of the river and the Aberdeen Area lies to the east. The Edgewood Area is listed on the National Priorities List (NPL). The NPL is USEPA's list of hazardous substance sites in the United States that are priorities for long-term remedial evaluation and response.

The approximately 460-acre J-Field Study Area, in the Eastern coastal plain adjacent to the Chesapeake Bay, is located at the southern end of the Gunpowder Neck peninsula in the Edgewood Area (Figure 2). J-Field is bordered to the north by another study area designated as Other Edgewood Areas that includes the other range fields. J-Field is bordered on three sides by tidal estuaries: Gunpowder River to the west, Chesapeake Bay to the south and Bush River to the east. Each of the three estuaries receive surface runoff and groundwater discharge from the J-Field area. Both the Gunpowder River and the Bush River drain into the Chesapeake Bay.

The site is underlain by more than 100 ft of Quaternary sediments of fluvial and estuarine origins and other older geologic formations. The terrain at J-Field is nearly flat, with a maximum relief of about ten feet. Marsh areas are common throughout J-Field. The groundwater table in the surficial aquifer is shallow usually less than seven feet below the ground surface. The groundwater is recharged through precipitation near uplands and is discharged to the surrounding lowlands.

The majority of J-Field is forested. The lowland areas support the development of extensive tidal marshes and palustrine wetlands. The marshes are dominated by common reed and cattail. Drier upland areas support occasional stands of yellow poplar or mixed deciduous hardwoods. The western portion of J-Field along the Gunpowder River consists of old open field areas dominated by up grasses.

The J-Field Study Area includes the Northern and Southern Main Burn Pit and Pushout Area, the Riot Control Burn Pit, the Robins Point Demolition Ground, the Robins Point Tower Site, the South Beach Trench, the South Beach Demolition Ground, the Prototype Building, the White Phosphorous Burn Pits, and several smaller test areas (designated as site XI, Area A, Area B, Area C, Area D, the Ruins Site, and several craters). Although all of these were included in the Remedial Investigation (RI) this decision document focuses solely on the J-Field SOU, which includes the Northern and Southern Main Burn Pits and Pushout Area.

## 2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 2.2.1 History of J-Field Soil Operable Unit

During World War II, J-Field was used to test high explosives and chemical munitions. J-Field was also used for the thermal and chemical decontamination of chemical munitions. Chemical agents, chemical wastes, and high explosives were burned or "open detonated" in the pits at J-Field. This Operable Unit consists of two main burn pits (the Northern Main Burn Pit and Southern Main Burn Pit). It also includes the Pushout Area which consists of the VX Burn Pit, the Mustard Burn Pit and the Liquid Smoke Disposal Pit (Figure 2).

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The pits were used extensively between the late 1940s and 1960s and to a lesser extent throughout the 1970s. The Northern and Southern Main Pits are each approximately 300 feet long with a total area of about 4,500 square feet. High explosive-filled munitions, nerve agents, mustard, liquid smoke, chlorinated solvents, and wastes were disposed in these pits between 1940 and 1980. High explosive-filled munitions were also "open burned" or detonated here during this time. Three smaller pits include the Mustard Burn Pit (approximately 100 feet long), a small Liquid Smoke Disposal Pit Area, have been buried. These pits were used in the same manner to dispose of VX, Mustard (dichlorodiethyl sulfide), and the primary components of liquid smoke: titanium tetrachloride and sulfur trioxide/chlorosulfonic acid.

Open burning initially involved placing three to four feet of wood dunnage in a pit. The materials to be burned were then placed on top of the dunnage. Fuel oil was added, and the material was ignited. Scrap metal items were removed and reburned in the same manner. The depths of the pits were maintained by pushing burned soil and ash out of the burn areas toward the adjacent marsh in an area that is collectively referred to as the Pushout Area. The Pushout Area occupies about 67,000 square feet and extends more than 100 feet into the marsh.

### 2.2.2 Enforcement Activities

The U.S. Army Toxic and Hazardous Materials Agency (renamed the U.S. Army Environmental Center (USAEC) reported that contamination at J-Field was first detected during an environmental survey of the Edgewood Area conducted in 1977 and 1978. Subsequent to this study, 11 groundwater monitoring wells were installed at J-Field to determined the extent of contamination. Contamination was also detected during a munitions disposal survey conducted in 1983 (Princeton Aqua Science, 1984). Princeton Aqua Science installed and sampled nine additional wells and collected and analyzed surface and subsurface composite soil samples.

In 1986, the USEPA issued a Resource Conservation and Recovery Act (RCRA) Permit (MD3-21-002-1355) requiring a base-wide RCRA Facility assessment (RFA) and a hydrogeologic assessment at J-Field. The U.S. Geological Survey (USGS) conducted a two phased hydrogeologic assessment which included soil gas investigations and the installation of several wells. A groundwater flow model of the J Field area was developed based on the hydrogeologic assessment. Groundwater and surface water monitoring programs were initiated, and samples continue to be collected as part of that monitoring program. The results of the USGS study are available in the administrative record.

2.2.2.1 Resource Conservation and Recovery Act Facility Assessment. In 1989, the U.S. Army Environmental Hygiene Agency (renamed U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)) conducted a RFA that addressed the entire Edgewood Area, including J-Field. The RFA recommended that a number of sites within the J-Field study be designated as RCRA solid Waste Management Units (SWMU) requiring further investigation and possible remediation.

The assessment of the J-Field SOU resulted in a recommendation that an additional investigation be conducted with a primary focus on marsh sediments and surface water adjacent to the J-Field SOU and a secondary focus on the shallow surficial aquifer.

2.2.2.2 Remedial Investigation/Feasibility Study. The entire Edgewood Area was designated as an NPL Site on February 21, 1990. This resulted in the requirement for a Remedial Investigation/Feasibility Study (RI/FS) for the entire Edgewood Area, pursuant to Modification 2 of the RCRA Permit and a March 1990 Federal Facility Agreement (FFA) between USEPA Region III and the U.S. Department of the Army. The current environmental study at J-Field is being conducted under the FFA, which incorporates both RCRA and CERCLA requirements.

The J-Field RI, completed in 1996, entailed the investigation of 15 areas features of J-Field, including the J-Field SOU. The conclusion made from the RI was that the main sources of contamination at J-Field included former toxic burn pits, the demolition grounds, and the suspect burn areas. The primary contaminants were identified as heavy metals, petroleum related compounds, ad chlorinated methanes, ethanes, and ethenes. Pesticides and PCBs were also present at the J-Field SOU. The contaminants present are the direct result of disposal, open burning, pushout, and open detonation activities that occurred at J-Field.

## 2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Focused Feasibility Study (FFA) and Proposed Plan for J-Field were released to the public on July 10, 1996, initiating a 45-day comment period, which was extended by 14 days. The documents constituting the administrative record for J-Field were made available to the public at the following locations:

- Harford County Public Library, Aberdeen and Edgewood Branches;
- Baltimore County Department of Environmental Protection, Towson, Maryland; and
- Miller Library at Washington College, Chestertowne, Maryland:

The notice of availability of the Proposed Plan was published in the several local newspapers in

Harford, Baltimore, Kent, and Cecil Counties. A public meeting was held at the Edgewood Senior Center in Edgewood, Maryland on August 12, 1996 to inform the public of the preferred alternative and to seek public comments. At this meeting, representatives from APG, USEPA, and MDE answered questions about conditions at the site and the remedial alternatives under consideration. Responses to the comments received during this 45-day period are included in the Responsiveness Summary appended to this ROD.

## 2.4 SCOPE AND ROLE OF THE J-FIELD SOIL OPERABLE UNIT

The interim action at the J-Field SOU represents one component of a comprehensive environmental investigation and clean-up action currently being performed at APG to comply with CERCLA requirements. This ROD addresses the soil contamination found in the J-Field SOU. This area poses a potential risk to human health and the environment resulting from elevated levels of metals and PCBs detected in the soil. The Liquid Smoke Disposal Pit, Southwestern Suspect Burn Area, Storage Area and the High Explosive Demolition Ground do not pose a risk to human health or the environment. The purpose of this action is to reduce the risk associated with the J-Field SOU by isolating or removing the contaminants.

## 2.5 SUMMARY OF SITE CHARACTERISTICS

Contamination detected in the soil at the J-Field SOU is summarized below by main site features (see Figure 3):

! Northern Main Burn Pit: The primary contaminants detected at and underlying the Northern Main Burn Pit are heavy metals and PCBs. The western portion of the Northern Main Burn Pit has higher concentrations of lead than the eastern portion. While heavy metals and petroleum related products as well as low levels of chlorinated solvents. phthalates, PCBs, and pesticides were detected in the upper ten feet of soil in the western portion of the Northern Main Burn Pit, the majority of contamination was in the upper two feet of surface soil. Of the contaminants present, only metals were found in significant concentrations to pose a potential risk human health and the environment. Heavy metals were detected in soils below ten feet, and low levels of metals and PCBs were detected in the eastern portion of the Northern Main Burn Pit, but neither presents a measurable risk.

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! Southern Main Burn Pit: Elevated levels of PCBs and Volatile Organic Compounds (VOCs) (chlorinated ethanes and ethylenes) were detected in the eastern portion of the Southern Main Burn Pit. VOC concentrations increased with depth. Semivolatile Organic Compounds (SVOC) were also found in the upper two feet of soil. The concentration of heavy metals detected in the Southern Main Burn Pit is lower than that of the Northern Main Burn Pit; arsenic, cadmium, copper, lead, and zinc were detected in surface soils. The Primary chemical of potential concern (COPC), and the only one for which remediation is necessary, in the Southern Main Burn Pit are PCBs detected in the upper four feet of soil in a localized area.

! Pushout Area: The upper four feet of soil in the Pushout Area exhibit some heavy metal contamination, with the highest concentrations in the eastern portion. Contamination type and level vary throughout the area and are likely related to the amount and content of the pushout material in any given area. Toxicity Characteristic Leaching Procedure (TCLP) analyses indicate that the pushout area is considered hazardous with respect to lead, with levels above 8% in some areas. Chlorinated methanes, ethanes and ethylenes, petroleum related compounds, PCBs, and pesticides were present in surface soils, but no explosives were detected. Lead is the only contaminant that requires excavation in' the Pushout Area.

! VX Burn Pit: The VX Burn Pit within the Pushout Area, now filled, has moderately elevated levels of heavy metals in the upper two feet of soil. Low levels of chlorinated ethanes and ethenes, petroleum-related compounds, pesticides, dioxins and furans, 1,4-dithiane (a mustard degradation product), and phthalates also were detected. Total Petroleum Hydrocarbons (TPH) were detected in the deeper soil.

! Mustard Burn Pit: The soil borings were drilled adjacent to the Mustard Burn Pit due to the presence of metallic hits in the pit during the UXO metallic clearance survey. Heavy metals were found in the upper two feet of soil, including elevated levels of arsenic, lead, and zinc. Low levels of chlorinated ethanes and ethenes were detected in surface and subsurface samples.  Very low levels of petroleum related compounds also were detected in surface soil.

- Liquid Smoke Disposal Pit:  Titanium chloride, a major component of liquid smoke was detected inside the pit during x-ray fluorescence field measurements.  Elevated levels of heavy metals were found in a soil sample.

Table 1 provides a listing of COPCs detected in soil collected from the Northern and Southern Main Burn Pits and Pushout Area with a comparison to human health RBCs and regional background. For comparison, human health RBCs are shown in Table 1 for each COPC.  Ecological COPCs are indicated with and asterisk. This decision document addresses the remedial actions associated with the J-Field SOU; however, any associated groundwater, surface water and sediment contamination will be addressed in the RI/FS for the remaining J-Field areas.

## 2.6 SUMMARY OF SITE RISKS

### 2.6.1 Human Health Risks

A Human Health Baseline Risk Assessment (RA) was completed as part of the RI for the J-Field SOU to characterize the current and potential future risks associated with site-related chemicals in ground water, soil, sediment, and surface water.  As noted above, however, only risks associated with exposures to chemicals in soil are discussed in this document.

TABLE 1

CHEMICALS OF POTENTIAL CONCERN DETECTED IN
SOIL SAMPLES COLLECTED FROM THE J-FIELD SOIL OPERABLE UNIT

| Compound | Maximum Detected Concentration* (mg/kg) | Risk-Based Concentrationb (mg/kg) | Background (mg/kg) |
|---|---|---|---|
| Volatile organic compounds | | | |
| Acetone* | 0.02 | 200,000 | ND |
| Benzene* | 0.1 | 200 | ND |
| Carbon disulfide* | 0.040 | 200,000 | ND |
| Chlorobenzene | 0.1 | 41,000 | ND |
| Chloroform | 0.05 | 940 | ND |
| 1,1 Dichloroethylene* | 0.10 | 9.5 | ND |
| trans-1,2 Dichoroethylene | 0.17 | 18,000 | ND |
| Methyl ethyl ketone | 0.014 | 1,000,000 | ND |
| Methylene chloride | 0.10 | 760 | ND |
| Tetrachloroethane* | 2.5 | 29 | ND |
| Tetrachloro-ethylene | 1.0 | 110 | ND |
| Toluene | 0.05 | 410,000 | ND |
| Trichloroethylene* | 2.8 | 520 | ND |
| Xylenes* | 0.05 | 1,000,000 | ND |
| Semivolatile organic compounds | | | |
| Benzo(b)fluoranthene* | 0.66 | 7.8 | 0.035 - 0.35 |
| Benzo(k)fluoranthene* | 0.51 | 78 | 0.036 - 0.140 |
| Bis(2-chloroethyl)ether* | 0.05 | 5.2 | ND |
| Diethyl phthalate* | 0.145 | 1,000,000 | 0.041 - 0.072 |
| Fluorene* | 0.068 | 82,000 | 0.033 - 3.2 |
| Hexachorobenzene* | 2.17 | 3.6 | ND |
| Hexachloroethane* | 0.59 | 410 | ND |
| 2-Methylnaphthalene* | 0.23 | NAc | ND |
| 2-Methylphenol* | 0.69 | 100,000 | ND |
| 4-Methylphenol* | 0.715 | 10,000 | ND |
| N-Nitrosodiphenylamine* | 0.8 | 1,200 | ND |
| Phenol* | 0.43 | 1,000,000 | ND |
| Pyrene | 0.652 | 61,000 | 0.038 - 0.620 |
| 2,4,6-Trichloroaniline* | 7.9 | 170 | ND |
| Explosives | | | |
| Nitroglycerin* | 15.3 | NA | ND |

TABLE 1 (continued)

CHEMICALS OF POTENTIAL CONCERN DETECTED IN
SOIL SAMPLES COLLECTED FROM THE J-FIELD SOIL OPERABLE UNIT

| Compound | Maximum Detected Concentration* (mg/kg) | Risk-Based Concentrationb (mg/kg) | Background (mg/kg) |
|---|---|---|---|
| Inorganic materials | | | |
| Aluminum* | 22,600 | 1,000,000 | 2,630 - 16,900 |
| Antimony* | 501 | 820 | ND |
| Arsenic* | 1,440 | 3.8 | 1.1 - 3.7 |
| Barium* | 1,580 | 140,000 | 9.8 - 202 |
| Beryllum* | 0.98 | 1.3 | 0.62 - 1.1 |
| Cadmium | 50 | 1,000 | 0.86 - 1.4 |
| Calcuim | 36,000 | -e | 71 - 1,980 |
| Chromium* | 878 | 10,000 | 5.3 - 69 |
| Cobalt* | 11 | 120,000 | 1.5 - 26 |
| Copper* | 4,320 | 82,000 | 3.0 - 33 |
| Cyanide* | 66 | 41,000 | ND |
| Iron* | 154,000 | 610,000 | 3.190 - 23.5000 |
| Lead* | 94,200 | | 5.5 - 294 |
| Magnesium* | 3,880 | - | 63 - 3,920 |
| Maganese | 633 | 10,000 | 4.95 - 1140 |
| Mercury* | 22 | 610 | 0.07 |
| Molybdenum | 6.9 | 10,000 | ND |
| Nickel* | 76 | 41,000 | 2.7 - 24 |
| Potassium* | 1,460 | -e | 96 - 1700 |
| Selenium* | 2.8 | 10,000 | 0.44 - 0.50 |
| Silver* | 42 | 10,000 | ND |
| Sodium | 521 | -e | 366 - 658 |
| Thallium | 7.9 | 160e | ND |
| Vanadium* | 167 | 14,000 | 11 - 59 |
| Zinc | 84,485 | 610,000 | 4.9 - 242 |

a Maximum detected concentrations for surface soil samples (O-2 ft in depth). These values were taken from table C-13 of the Remedial Investigation.
b EPA (1995), for industrial soil.
c NA = not available
d Risk-based concentrations for PCB isomers are based Aroclor mixtures.
e Risk-based concentrations for these compounds are not available due to low toxicity.
f This level is considered to be a reasonable level with which to determine whether a potential exists for adverse effects to industrial workers due to lead exposures.
g A risk-based concentration was not available for the class of thallium compounds, so the value for thallium sulfate as used instead.

* Ecological Chemicals of Potential Concern
ND Not Detected

The Human Health RA evaluated contaminant concentrations detected in the samples collected during the RI, the toxicity of these contaminants, and the possible human exposure to these contaminants. Based on this information, conservative estimates of risk were determined following USEPA guidance to ensure that potential health effects were not underestimated. The Human Health RA consisted of contaminant identification, exposure assessment, toxicity assessment, and risk characterization. These RA steps are summarized below.

COPCs were selected for soil in the J-Field SOU, and Table 2 summarizes the COPCs selected for each pit. Contaminant identification consisted of several screening procedures to select COPCs for quantitative evaluation. COPCs were selected for use in the RA based on an evaluation of the data, a comparison of maximum site concentrations to USEPA Region III Risk-Based Concentrations (RBCs), and for inorganics, a statistical comparison of site and reference concentrations. As shown in Table 2, only inorganic chemicals were selected as COPCs in soil at the J-Field SOU.

The objective of the exposure assessment is to estimate the type and magnitude of potential exposures to the COPCs that are present at or migrating from the site. Under the current land use scenario, exposure pathways evaluated include incidental ingestion and dermal absorption of chemicals in surface soil by a demolition worker. The future uses of the J-Field SOU that were considered include military and industrial uses. Exposure pathways evaluated for the future land use scenario include incidental ingestion and dermal absorption of chemicals in surface soil by an industrial worker and a trespasser. The RA addressed the exposure pathways from all media although this decision document focuses on the risks associated with exposures to surface soil at the J-Field SOU. The risks associated with exposures to surface water and sediment will be addressed in the RI/FS for the remaining areas of concern at J-Field.

The purpose of the toxicity assessment is to assess the toxicological hazards of COPCs as a function of the anticipated routes of exposure. Quantitative indices of toxicity include cancer slope factors (CSFs) for chemicals exhibiting carcinogenic effects and reference doses (RfDs) for chemicals exhibiting noncarcinogenic effects. USEPA developed CSFs using conservative assumptions for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in terms of reciprocal dose (milligram per kilogram per day)-1 or ([mg/kg]-1), are multiplied by the estimated intake of a potential carcinogen, in milligrams/kilogram-day (mg/kg-day) to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level.

The RfDs have been developed by USEPA to indicate the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, expressed in units of mg/kg-day, are estimates of daily exposure levels for humans, including sensitive individuals, that are likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs incorporate uncertainty factors that help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects. Estimated intakes of chemicals from environmental media in units of mg/kg-day can be compared to the RfD to determine whether adverse noncarcinogenic effects could occur.

The purpose of the risk characterization is to relate exposure estimates to toxicity data in order to estimate potential excess lifetime cancer risks for carcinogens or the potential for adverse effects for noncarcinogens. Excess lifetime cancer risk which are determined by multiplying the intake level by the CSF, are probabilities that are generally expressed in scientific notation (e.g., 1x10-6 or 1E-06). An excess lifetime cancer risk of 1x10-6 indicates the probability that an individual has a one in 1 million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specified exposure conditions. USEPA's acceptable risk range for cancer is 1x10-4 to 1x10-6, meaning there is one additional chance in 10,000 (1x10-4) to one additional chance in one million (1x10-6) that a person will develop cancer.

Noncarcinogenic effects are expressed as the hazard quotient (HQ), which is the ratio of the estimated intake of the noncarcinogen to its respective RfD. The hazard index (HI) can be generated by adding the HQs for all contaminants within a medium and provides a useful reference point for gauging the potential for adverse effects associated with noncarcinogenic chemicals within a single medium. An HI of less than one indicates that the human population is not likely to experience adverse health effects.

TABLE 2
SUMMARY OF THE HUMAN CHEMICALS OF POTENTIAL CONCERN
AT THE J-FIELD SOIL OPERABLE UNIT

| Compound | Surface Soil | | | | |
|---|---|---|---|---|---|
| | North BP | South BP | VX BP | Mustard BP | Push-Out |
| Inorganics: | | | | | |
| Antimony | - | - | - | - | X |
| Arsenic | X | X | X | X | X |
| Lead | X | X | X | X | X |
| Zinc | - | - | - | - | X |

X: Selection as a chemical of potential concern.
-: Chemical was either not detected or was present at concentrations below its respective RBC.

Table 3 and the following discussion summarize risks associated with exposure to surface soil that were presented in the RA.

2.6.1.1 Current Land Use. The J-Field Study Area is located in the Edgewood restricted area of APG. Access to the restricted is strictly controlled and a wide variety of physical security measures are in place to prevent unauthorized personnel from entering the area.

Under current land use conditions, risks due to ingestion and dermal absorption of chemicals in surface soil were summed for demolition workers. The cumulative risk due to ingestion and dermal exposures was within the USEPA risk range of 1x10-6 to 1x10-4, while the cumulative hazard index was below one. Therefore the risk, associated with the current land-use scenario falls within the acceptable range as defined by USEPA, and adverse effects associated with noncarcinogenic chemicals would not be likely to occur.

2.6.1.2 Future Land Use. Under future land use conditions, risk were calculated for industrial workers and trespassers. The risks for an industrial worker due to incidental ingestion and dermal absorption of chemicals in surface soil was 3x10-4(3 in 10,000), which exceeded USEPA's target risk range of 1x10-6 to 1x10-4, while the total hazard index was slightly greater than one (1.4). The carcinogenic risk and hazard index were primarily driven by dermal exposures to arsenic in the Northern Main Burn Pit soil. In order to interpret these risks, several uncertainties should be addressed. There are uncertainties associated with the arsenic toxicity criterion (as discussed in the Uncertainties Section of the human health RA), with the dermal pathway model, with the fact that only one sample was collected from this source area and with the fact that this scenario assumes that future workers would work at the J-Field SOU on a regular basis.

The total excess lifetime cancer risk for a trespasser due to incidental ingestion and dermal absorption of chemicals in surface soil was 1x10-4, which is at the high end of USEPA's risk range for health protectiveness at Superfund sites. The total hazard index for trespassers was less than one. indicating that adverse noncarcinogenic effects would not be likely to occur as a result of exposures via contact with chemicals in surface soil. The carcinogenic risk was primarily driven by exposures to arsenic in the Northern Main Burn Pit surface soil. It should be noted that the risk and hazard indices estimated for the trespasser are associated with the same uncertainties as listed above exposures and in assuming that the same trespassers would actually be present at the J-Field SOU on a regular basis for 30 years.

2.6.1.3 Exposures to Lead. Lead was detected with maximum concentrations exceeding the industrial soil screening concentration of 1,000 mg/kg in the Northern Main Burn Pit, the Mustard Burn Pit, and the Pushout Area. The industrial screening concentration of 1,000 mg/kg is a reasonable level used to determine the potential for adverse effects to industrial workers. The area with the highest lead concentrations and the greatest frequency of elevated lead detections was the Pushout Area. It is not likely that workers would actually frequent the J-Field SOU on a regular basis and trespassers are not likely to be adversely affected due to their assumed limited frequency of exposure at the J-Field SOU.

2.6.2 Environment Risks

The Ecological RA was conducted in three phases. Phase 1 included: 1) qualitative and quantitative boitic surveys; 2) toxicity testing of soil, sediment, surface water, and groundwater; and 3) identification of ecological COPCs based on RI data. Phase 2 included: 1) additional toxicity testing; 2) surveys of biologically mediated soil processes; and 3) residue analyses of biological tissue. Contaminant uptake models, developed in Phase 2 and refined in Phase 3, were used to predict contaminant doses to high level ecological receptors. The results of Phase 1 and Phase 2 were used in Phase 3 to evaluate the risk to ecological receptors. Phase 3 integrated the risk estimates derived from the uptake modeling results with the results of the exposure and effects assessments to characterize ecological risk at the J-Field SOU.

TABLE 3

SUMMARY OF PATHWAY SPECIFIC AND
CUMULATIVE RISKS ASSOCIATED WITH HUMAN HEALTH
EXPOSURES AT THE J-FIELD SOIL OPERABLE UNIT

| Receptor/Pathway | Cancer Risk | Non-Cancer Hazard Index |
|---|---|---|
| **Current Land-Use Conditions** | | |
| Demolition Worker | | |
| Soil Ingestion | 2x10-5 | 1x10-1 |
| Dermal Absorption | 3x10-5 | 2x10-1 |
| Cumulative Risk | 5x10-5 | 3x10-1 |
| **Future Land-Use Conditions** | | |
| Industrial Worker | | |
| Soil Ingestion | 8x10-5 | 5x10-1 |
| Dermal Absorption | 2x10-4 | 9x10-1 |
| Cumulative Risk | 3x10-4 | 1.4 |
| Trespasser | | |
| Soil Ingestion | 4x10-5 | 2x10-1 |
| Dermal Absorption | 7x10-5 | 3x10-1 |
| Cumulative Risk | 1x10-4 | 0.5 |

The first task of the Ecological RA was to summarize the COPCs by comparing media concentrations with chemical-specific factors including background concentrations, regulatory standards and screening toxicity values. Other factors considered in the screening process were frequency of detection, ability to bioaccumulate, importance as a nutrient, and known toxicity.

The first step in the evaluation of chemicals was the background comparison for inorganics which involved a statistical comparison of site concentrations and background concentrations for each medium to identify chemicals occurring at concentrations above background. The Ecological RA for J-Field indicates a statistical procedure consistent with the Human Health Evaluation Manual (USEPA, 1989c) and USEPA Region III guidance (USEPA, 1993) was used to identify COPCs. Occasionally insufficient data were available for a statistical comparison. In these cases, the maximum reported contration was compared to the maximum background concentration. Chemicals with maximum concentrtions exceeding the maximum background were retained for further analysis.

All chemicals were then compared to available regulatory standards or benchmark values that represent medimum-specific contaminant concentrations considered protective of biota. The benchmark values were selected from many sources, including USEPA reports, agency reports, and the scientific literature. All chemicals detected at concentrations exceeding either a regulatory standard or benchmark value were retained as the final ecological COPCs, regardless of whether or not they were detected at concentrations above background. Table 4 indicates those chemicals selected as ecological COPCs at the J-Field SOU, identifies the range of concentrations detected at on site and background locations and presents screening concentrations used in the Ecological RA in conjunction with statistical analysis to identify COPCs. The rational for selecting each chemical as a COPC was also presented in Table 4.

The receptors selected for evaluation at the J-Field SOU were grasses, maple trees, common reeds phytoplankton, zooplankton, golden shiners, leopard frogs, great blue herons, American kestrels red-tailed hawks. American robins, tree swallows, mallard ducks, white-tailed deer, muskrats white-footed mice, eastern cottontails, and red foxes (Table 5). Potential exposure pathways were reviewed and selected for quantitative evaluation in the ecological RA by using uptake modeling. The following complete exposure pathways were evaluated: 1) incidental ingestion of soil or sediment; 2) ingestion of drinking water; 3) food chain transfer and uptake of COPCs; 4) root uptake in vegetation; and 5) dermal absorption for terrestrial invertebrates and aquatic biota. The primary exposure route for most wildlife was food chain uptake. The applied daily doses (ADD) of ecological COPCs for individual receptors were estimated by modeling the selected exposure routes.

The biological studies were classified as either exposure assessments or effects assessments. Exposure assessments characterized the co-occurrence of ecological receptors with the distribution of ecological COPCs by either: 1) directly measuring COPC concentrations in biological tissues; or 2) modeling COPC uptake and estimating ADDs. The effects assessments used field studies and laboratory toxicity testing of site media to identify and quantify actual adverse effects at the J-Field SOU. The following paragraphs discuss the exposure and effects assessments conducted at the J-Field SOU.

Terrestrial vegetation (common reed), terrestrial invertebrates (grasshoppers and crickets), fish (shiners and minnows), amphibians (frogs), and small mammals (white-footed mice) were collected and analyzed for metals, SVOCs, pesticides, and PCBs in the first part of the exposure assessment. In some cases, tissue concentration in prey items were estimated using uptake modeling for those COPCs that were not included in the tissue analysis. ADDs were estimated for species more difficult to collect (mallard, great blue heron, American robin, tree swallow, American kestrel, red-tailed hawk, muskrat white-footed mouse, eastern cottontail, white-tailed deer, and red fox) based on modeling by using exposure point concentrations (95% upper confidence limit (UCL) of the arithmetic mean or maximum detected concentration) of COPCs in each medium and species-specific exposure factors, such as body weigh home range and diet composition. The potential for adverse effects on the receptor species was estimated by comparing the ADD to a contaminant-specific benchmark value representing a no effect ADD. The result is a ratio called Environmental Effects Quotient (EEQ).

TABLE 4
SUMMARY OF THE ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN DETECTED IN SOIL
AT THE J-FIELD SOIL OPERABLE UNIT

| Analyte | Range of Concentrations (ug/kg) | Range of Reference Concentrations (ug/kg) | Regulatory Standard/Ecological Benchmark Values> (ug/kg) |
|---|---|---|---|
| Organics: | | | |
| Acetone | 3 - 20 | - | - |
| Aroclor 1248 | 19.75- 570 | 25.53 - 29.41 | - |
| Benzene | 6 - 100 | - | - |
| Benzo(b)fluoranthene | 50 - 1,250 | 23 - 350 | 1,000 |
| Benzo(k)fluoranthene | 42 - 1,250 | 29 - 150 | 1,000 |
| 2-Butanone | 6 - 37 | - | - |
| Carbon disulfide | 2 - 38 | - | - |
| Chloroform | 6 - 50 | - | - |
| 1,1-Dechloroethene | 6 - 100 | - | - |
| Diethyl phthalate | 49 - 2,000 | 36 - 100 | - |
| 2-Methylnaphthalene | 71 - 1,250 | 120 - 150 | - |
| 2-Methylphenol | 75 - 1,250 | 160 - 210 | 1,000 |
| 4-Methylphenol | 91 - 1,250 | 160 - 210 | 1,000 |
| N-Nitrosodiphenylamine | 170 - 1,250 | 80 - 100 | - |
| Nitroglycerin | 5,000 - 15,300 | - | - |
| 1,1,2,2-Tetrachloroethane | 2 - 2,5000 | - | - |
| 2,4,6-Trichloroaniline | 20 - 7,900 | - | - |
| m+p-Xylene | 20 - 50 | - | - |
| Inorganics | | | |
| Aluminum | 4,240,000 - 22,600,000 | 2,630,000 - 16,900,000 | 50,000 |
| Arsenic | 0.11 - 1,440,000 | 249 - 3,740 | 5,200 |
| Barium | 2,110 - 1,580,000 | 9,830 - 202,000 | 440,000 |
| Cadmium | 0.23 - 35,500 | 570 - 1,400 | 970 |
| Chromium | 6.95 - 878,000 | 5,290 - 70,800 | 1,000 |
| Copper | 2 - 4,320,000 | 3,000 - 33,200 | 12,000 |
| Iron | 7,470,000- 154,000,000 | 3,190,000 - 23,500,000 | 279,235 |
| Lead | 5.050 - 94,200,000 | 5 490 - 294 000 | 16,000 |
| Magnesium | 765,000 - 3,880,000 | 63,000 - 3,920,000 | - |
| Mercury | 0.03 - 3,600 | 57 - 145 | 58 |
| Nickel | 3.5- 84,500 | 1,710 - 24,300 | 13,000 |
| Zinc | 20,200- 17,800,000 | 4,890 - 242,000 | 48,000 |

> Regulatory standards ecological benchmark values reflect screening values presented in J-Field ERA

TABLE 5

SUMMARY OF THE ECOLOGICAL RECEPTORS FOR THE J-FIELD SOIL OPERABLE UNIT

| Receptor | Habitat Type | Occurrence at the J-Field | Exposure Point Media | Likely to Visit Other Areas?a |
|---|---|---|---|---|
| Grasses (Andropogon spp.) | Upland | Pushout Area Main Pits Area | Soil | No |
| Maple (Acer spp.) | Upland | Southern portion of J-Field | Soil | No |
| Common reed | Wetlands | Marsh | Sediment | No |
| Phytoplankton and zooplankton | Quiet surface waters | Pond and Marsh | Surface water | No |
| Golden shiner | Quiet surface waters | Pond and Marsh Marsh edges | Surface water | No |
| Leopard frog | Quiet surface waters | Marsh and Pond margins | Surface water | No |
| Great blue heron | Surface water and wetland | Marsh and Pond margins | Surface water | Yes |
| American Kestrel | Semi-open grasslands | Pushout Area Main Pit Area | Soil and surface water | Yes |
| Red-tailed hawk | Wetlands, grasslands, and forests | Entire Area | Soil and surface water | Yes |
| American robin | Wetlands, grasslands, and forests | Entire Area | Soil and surface water | Yes |
| Tree swallow | Grasslands with wooded edges or nearby woodlots | Entire Area | Soil and surface water | Yes |
| Mallard duck | Wetlands with nearby grasslands | Pond, marsh and Pushout Area | Soil, surface water, and sediment | Yes |
| White-tailed deer | Old fields grass-lands, and forests | Entire Area | Soil and surface water | Yes |
| Muskrat | Surface waters and wetlands | Marsh and pond | Surface water and sediment | Yes |
| White-footed mouse | All upland habitats | Entire Area | Soil and surface water | No |
| Eastern cottontail | Upland habitats and marsh edges | Entire Area | Soil and surface water | Yes |
| Red fox | Wetlands, grass-lands, and forests | Entire Area | Soil and surface water | Yes |

a Likelihood to visit other areas based on size of home range or foraging area.

The effects assessment characterized actual effects on vegetation, soil biota, terrestrial vertebrates and aquatic biota using several approaches. The effects assessment for the J-Field SOU included: 1) qualitative and quantitative surveys of terrestrial and aquatic invertebrate and vertebrate biota and wetland and upland vegetation; 2) quantitative evaluations of soil invertebrate physiological parameters, such as enzyme activity and respiration rates; 3) quantitative evaluations of biologically mediated soil processes, such as litter decomposition and nitrogen mineralization; and 4) toxicity tests of site soils, sediments, and surface water using a variety of invertebrate, vertebrate, and plant test organisms. The specific receptors, levels of assessment, and the methods of the effects assessment are presented in Table 6.

2.6.2.1 Results of Exposure Assessment. The results of the tissue residue studies typically indicated low levels of COPC uptake by biota. Plant tissues were analyzed for metals, SVOCs, pesticides, and PCBs. The organic chemicals detected were two SVOCs (2-methylphenol and bis(2-ethylhexyl)phthalate and one pesticide (beta-BHC). Low levels of several inorganic analytes were detected, including aluminum, arsenic, and lead. Invertebrate tissues were analyzed for metals, SVOCs, pesticides, and PCBs. The only organic chemical detected was the pesticide dieldrin. Ten inorganic compounds were detected including seven heavy metals.

Small mammal tissues were sampled for metals, pesticides, and PCBs. Aroclor-1260, arsenic, barium, cadmium, chromium, and lead were the chemicals primarily detected in small mammal tissues. However, Aroclor-1260 was detected in only one of ten small mammal tissue samples. Furthermore, the inorganic compounds were present at low concentrations and none was detected at concentrations significantly greater than those collected from reference locations.

2.6.2.2 Results of Effects Assessment. More than 100 bird species were identified during the vertebrate surveys, suggesting a diverse bird community is either inhabiting or using the J-Field SOU Mourning doves. American robins, white-throated sparrows, and song sparrows were some of the most common species. In addition, ospreys have frequently been observed flying over the J-Field SOU. White-footed mouse, meadow vole, short-tailed shrew, and red fox were the mammal species collected or observed at the J-Field SOU. Four amphibian species were also collected. None of the bird, mammal, and amphibian specimens exhibited any external abnormalities (such as lesions or tumors).

A comparison between total macroinvertebrate numbers, bacterial and fungal biomass, and nematode numbers in soils from the J-Field SOU and on-site reference locations indicated a significant reduction at the J-Field SOU particularly the Pushout Area. In addition there was a difference in the trophic structure of the nematode community at the Pushout Area in comparison to the reference site. Other significant differences between the Pushout Area and the reference site include lower activity of several bacterial and fungal nutrient-acquiring enzymes (enzyme activity was significantly and negatively correlated with the total metal content of the soil), and lower substrate-induced respiration and soil nitrogen dynamics.

Both lethal and sublethal effects were observed in earthworms and vegetation after exposures to J-Field SOU soils. Exposures to soils from the Southern Main Burn Pit and Pushout Area resulted in nearly 100% mortality in earthworms. In addition, significant earthworm weight loss was detected in soil mixtures containing >25% site soil from these two areas. Seeding emergencies rates of less than or equal to 2.5% from exposures to soils from the Pushout Area and the Southern Main Pit were observed. In addition seeding emergence rates were <75% from other areas of J-Field.

2.6.2.3 Environmental Risk Conclusions. The EEQ risk estimates identified several ecological COPCs as posing potentially high to extreme risks to wildlife. These risks are associated primarily with soil levels of aluminum, antimony, arsenic, cadmium, chromium, cyanide, lead, mercury, selenium, and zinc. The EEQs associated with these COPCs were greater than 100 for at least one modeled ecological receptor at the J-Field SOU. However, these results were frequently based on uptake results using the maximum detected concentrations at the J-Field SOU, which can lead to an overestimation of risk.

TABLE 6

SUMMARY OF THE ECOLOGICAL RECEPTORS, ASSESSMENT LEVELS,AND EFFECTS ASSESSMENT METHOD FOR THE J-FIELD SOIL OPERABLE UNIT

| Ecological | Assessment | Effects Assessment Method |
|---|---|---|
| Vegetation | Individual | Soil toxicity test evaluating seeding germination rates, seeding growth, and |
| | Population and community | Quantitative surveys to determine species diversity and quantify total plant biomass |
| Soil Invertebrates | Individual | Soil toxicity tests evaluating earthworm survival; quantitative surveys to determine abundance of soil-dwelling and epigeic |
| | Population and community | Quantitative surveys to determine species diversity of macroinvertebrates, abundance and trophic structure of nematode communities, and abundance of protozoa; surveys to determine total and active fungal and bacterial biomass |
| | Biologically mediated soil processes | Evaluations of soil respiration rates, litter decomposition rates, extracellular nutrient-acquiring microbial enzyme activity, and nitrogen mineralization rates |
| Terrestrial Vertebrates | Individual | Qualitative surveys of amphibian and avian abundance |
| | Population and community | Evaluation of avian reproductive success with bird nest boxes |

The ecological RA concluded that extensive adverse ecological effects are evident at the J-Field SOU, but are limited to soil biota and vegetation and some of the aquatic components. Based on the results of the EEQ analyses and the effects assessment studies where 20 of 30 evaluated parameters were adversely affected at the J-Field SOU, the ecological RA also concluded that the J-Field SOU poses a high risk to ecological resources.

The results of 12 of the 15 effects assessments evaluating terrestrial media, biota, and habitats identified adverse ecological effects to ecological receptors at the J-Field SOU. Moderate to extreme risks from soil contamination were determined for terrestrial vegetation and terrestrial receptors mainly from exposures to inorganics. The areas of greatest concern appear to be the Pushout Area and the Main Burn Pits. The contaminated soils in the Pushout Area may also be the source of contamination and high risk identified in surface water and sediment along the marsh-Pushout Area boundary. The ecological RA concluded the the overall ecological risk from contaminated soils at the J-Field SOU is high based on the high EEQs and the number of effects assessment parameters where adverse effects were identified.

In summary, adverse effects that are ecologically significant on a local scale (J-Field) could be occurring due to current levels of contamination at the J-Field SOU. In addition, these levels of contamination could pose adverse effects to wide-ranging biota that are not restricted to the J-Field boundary, including migratory waterfowl and top-level avian predators (in particular, red-tailed hawk and American kestrel).

## 2.7 REMEDIATION OF THE J-FIELD SOIL OPERABLE UNIT

The Army used the conclusions from the RI, the Remedial Action Objectives (RAO) listed in the FS, and ARARs to set clean-up objectives for soil contamination at the J-Field SOU. The clean-up objectives for soil are to reduce exposure of human health and environmental receptors to surface soil contamination in the three source areas: the Northern Main Burn Pit, the Southern Main Burn Pit, and the Pushout Area. Part of the reduction of exposure pathways is the reduction or prevention of contaminant migration through surface runoff and downward leaching through these areas. The Mustard Burn Pit and the VX Burn Pit, now filled, are located in the Pushout Area. It is anticipated that contaminated surface soil found in these filled pits will be addressed through remediation of the Pushout Area. Actual or threatened releases of hazardous substances from the surface soil, if not addressed by implementing the response action selected in the ROD, may present an imminent and substantial endangerment to public health welfare or the environment.

### 2.7.1 Description of the Alternatives

2.7.1.1 Alternative 1: No Action. The No Action alternative does not include any remedial actions to contain, remove, or treat the soil at the J-Field SOU. Evaluation of the No Action alternative provides a baseline against which to measure other remedial alternatives. Institutional control measures including access restriction, ownership and use or deed restrictions, and monitoring would remain in effect as part of this alternative under the assumption of continued land ownership by the U.S. Army.

The following major ARARs are cited as part of Alternative 1:

! Contaminated soil is left in place; therefore, RCRA closure and post-closure requirements specified by Code of Maryland Regulations (COMAR) (COMAR 26.13.05.06 and 26.13.05.07) apply. The No Action alternative does not meet closure requirements which mandate that measures be taken to prevent the migration of contaminants.

The costs for Alternative 1 are as follows:

! Capital costs: $0

! Operations and Maintenance (O&M) cost: $10,000/year

! Net Present Worth: $153,725 for 30 years

There is no implementation time required for this alternative because the main components of this alternative are currently in place.

2.7.1.2 Alternative 2: In-Situ Containment and Limited Disposal. This alternative involves the excavation of approximately 425 cubic yards of soil from the Northern and Southern Main Burn Pits and 1,200 cubic yards of soil from the Pushout Area. This estimate is based on removing the contaminated soil to below 1,000 mg/kg for lead, 328 mg/kg for arsenic, and less than 25 mg/kg for PCBs. The excavated soil would be treated and disposed of at an off-site facility. The in-situ containment portion of this alternative includes the placement of a PSB over the Northern and Southern Main Burn Pits and Pushout Area.  Erosion control measures would also be implemented at the J-Field SOU and along the shoreline.  While the erosion of the shoreline does not pose an imminent threat from contaminated areas of J-Field, by combining this action with the J-Field SOU remedial action, the erosion threat is reduced and the natural resources are preserved.  The major components of Alternative 2 are described below

- UXO screening and site preparation activities will be conducted prior to the initiation of any remedial actions.  The UXO clearance will entail visually surveying the J-Field SOU and screening approximately 3,000 feet of shoreline.  Site preparation will entail the clearance of vegetation and the construction of access roads.  The UXO screening and site preparation activities will be conducted in accordance with the Noise Control Act (42 USC 4901 et seq.) and the Occupational Safety and Health Administration (OSHA) Standards (29 CFR 1910.95(g)).

- The soil will be excavated form the Northern and Southern Main Burn Pits and Pushout Area in accordance with the Toxic Substance Control Act (TSCA) Section 6(e), the Maryland Nonpoint Source Pollution Control Laws (EN Sections 4-201 et seq. and COMAR 26.09.05), the Nontidal Wetlands Protection Act, Annotated Code of Maryland (NR Sections 8-1201 et seq. and COMAR 08.05.04).

- The excavated soil will be transported, treated, and disposed of at an off-site facility in accordance with the Maryland Air Quality Control Act (COMAR 26.11.01,.03 and .06), the Maryland Landfill Siting Law (COMAR 26.04.07), the Maryland Storage, Treatment, or Disposal Requirements (COMAR 26.13.05), and the Hazardous Material Transportation Act (49 CFR Parts 172-179).  Lead and arsenic will be stabilized prior to disposal.  PCB levels above 50 mg/kg will be drummed for incineration; below 50 mg/kg will be stabilized prior to disposal.

- A PSB, underlain by a geotextile membrane and including a barrier to burrowing animals will be placed over the Northern and Southern Main Burns Pits in accordance with all applicable regulations including the Maryland Nonpoint Source Pollution Control Laws (COMAR 26.09.05), and the Nontidal Wetlands Protection Area (COMAR 08.05.04).

- Scrap metal collected during the excavation will be decontaminated and stored for recycling by the Defense Reutilization and Management Office, or disposed off site at an appropriate landfill.

- Performance monitoring of the PSB would be consistent with the closure and post closure requirements (COMAR 26.13.05,.06, and .07, and COMAR 26.04.07.21 and .22) to assure that PSB requirements are maintained and human health and the environment are protected.

This alternative meets clean-up objectives to reduce exposure of human health and environmental receptors to surface soil contamination in the source areas and minimizes the potential for contaminant migration through downward leaching and surface runoff through these areas.

The costs for Alternative 2 are as follows:

- Capital costs:  $2,347,000

- O&M costs:  $10,000/year

- Net Present Worth (30 years):  $2,769,000

This alternative is expected to take three months to implement.

2.7.1.3  Alternative 3:  Removal and Short Term Storage.  This alternative consists of the removal of approximately 16,000 cubic yards of contaminated soil from the J-Field SOU.  The volume of soil to be excavated is based on the removal of soils to levels that are protective of human health and the environment.  A storage facility meeting the design requirements of a RCRA waste pile storage unit would be constructed adjacent to the J-Field SOU at the Prototype Building.  Excavated soil would be transported by truck from the work area to the storage location and storage for approximately five years. at which time the soil would be sent off-site for treatment and disposal unless alternative disposal technology is available at that time.  The major components of this alternative are described below.

- UXO screening and site preparation activities will be conducted prior to the initiation of any remedial actions.  The UXO clearance will entail screening approximately 218,000 square feet of soil in the work zone to a depth of four feet. Site preparation activities will involve the clearance of vegetative areas and construction of access roads in the area of the J-Field SOU where remedial actions will occur. The UXO screening and site preparation activities will be conducted in accordance with the Noise Control Act as amended the Noise Pollution and Abatement Act (42 USC 4901 et seq.) and the OSHA Standards (29 CFR 1910.95(g)).

- ! The soil will be excavated from the J-Field SOU in accordance with the TSCA, the Maryland Nonpoint Source Pollution Control Laws (EN Sections 4-201 et seq. and COMAR 26.09.05), the Non-tide Wetlands Protection Act, Annotated Code of Maryland (NR Sections 8-1201 et sequence and COMAR 08.05.04), the Noise Control Act as amended the Noise Pollution and Abatement Act (42 USC 4901 et seq.) and the OSHA Standards (29 CFR 1910.95(g)).

- ! A storage facility located in the vicinity of the Prototype Building would be constructed using fabric covered steel arch trusses. Design features (e.g., leachate collections system, concrete pad, layer of impermeable clay, concrete barriers, VOC air scrubber system) would be implemented to meet RCRA regulations pertaining to waste piles. The storage facility would be constructed and the contaminated soil stored in accordance with the applicable regulations pertaining to storage of material (COMAR 26.13.02, COMAR 26.13.05, and 40 CFR Part 264).

- ! The excavated soil will be transported to, treated, and disposed of at an off-site facility in accordance with the Maryland Air Quality Control Act (COMAR 26.11.01. COMAR 26.11.03, and COMAR 26.11.06), the Maryland Landfill Siting Law (COMAR 26.04.07), the Maryland treatment and disposal requirements (COMAR 26.13.05), and the Hazardous Material Transportation Act (49 CFR Parts 172-179), unless alternate disposal technology is available, in which case it will be evaluated in comparison to off-site disposal and subjected to the same requirements.

- ! Performance monitoring would be conducted to ensure that the excavated soil is being stored in accordance with all applicable requirements.

This alternative meets clean-up objectives to reduce exposure of human health and environmental receptors to surficial soil contamination in the source area and minimizes the potential for contaminant migration and downward leaching through these areas.

The costs for Alternative 3 are as follows:

- ! Capital costs: $4,132,000

- ! O&M costs: $29,000

- ! Net Present Worth (30 years): $4,578,00

This alternative is expected to take three months to implement.

2.7.1.4 Alternative 4: Removal, On-Site Treatment, and Limited Disposal. This alternative involves the removal of approximately 16,000 cubic yards of contaminated soils to reduce metals and organics soil contaminant concentrations to levels that are protective of human health and the environment. Soil would be removed from the J-Field SOU using standard excavation in construction equipment. The excavated soil would be temporarily stored near J-Field, treated on-site using a soil washing/leaching treating system and returned as clean fill to the source location. Approximately 500 cubic yards of PCB contaminated soil would be excavated from the Southern Main Burn Pit and transported off-site for treatment and disposal. The major components of this remedial alternative are described below.

- ! UXO screening and site preparation activities will be conducted prior to the initiation of any remedial actions. The UXO screening will entail screening approximately 218,000 square feet of soil in the work to a depth of four feet. Site preparation activities will involve the clearance of vegetative areas and construction of access roads in the area of the J-Field SOU where remedial actions will occur. The UXO screening and site preparation activities will be conducted in accordance with the Noise Control Act as amended the Noise Pollution and Abatement Act (42 USC 4901 et seq.) and the OSHA Standards (29 CFR 1910.95(g)).

- ! Excavation of the hot spot areas of lead, arsenic, and PCB contaminated soil from the J-

Field SOU would be accomplished using hand excavation. After excavation, soil would be transported to the temporary staging area using standard earth moving equipment. Excavated soil awaiting treatment would be temporarily stockpiled on a bermed and drained concrete or asphalt pad and covered with plastic laminate to control dust and vapor emissions. The soil would be excavated, transported for stockpiling, and stockpiled in accordance with all applicable regulations including the Maryland Nonpoint Source Pollution Control Laws (COMAR 26.09.05), the Maryland Air Quality Control Act (COMAR 26.11.01), and the Maryland Requirements for Hazardous Waste (COMAR 26.13.02).

- A temporary or portable soil washing/leaching treatment system would be constructed on site to treat the excavated soils, with the exception of approximately 500 cubic yards of soil containing PCBs at concentrations in excess of the USEPA Region III industrial carcinogenic RBC of 0.74 mg/kg. The soil washing/leaching treatment system would be used to treat metals and SVOC contaminated soils by: 1) physically separating metallic fragments; 2) physically separating soil into various size fractions (course sand and gravel; fine sand; and silt and clay); 3) chemically removing metals bound to sand, silt and clay; and 4) precipitating metals out of the wash for recovery. The contaminated soils will be treated in accordance with all applicable regulations including the Maryland Requirements for Hazardous Waste (COMAR 26.13.02), the Maryland Requirements for emissions from a treatment system (COMAR 26.11.06.06), the Maryland Requirements for waste treatment (COMAR 26.13.05), and the TSCA. Wastewater generated during soil treatment would be disposed off-site in accordance with all applicable regulations.

- The treated soil product would be placed in a pile located adjacent to the treatment plant. The treated soil would be sampled and analyzed to ensure treatment goals have been met. Once the excavated and treatment activities were complete, the excavated area would be backfilled with the treated soil. Additional clean soil would be obtained from an off site source to be used as backfill as necessary. The excavated area would be regraded, covered with top soil, and seeded. The backfilling of treated soil will be conducted in accordance with all applicable regulations including the Maryland Requirements pertaining to thee treatment and disposal of hazardous wastes (COMAR 26.13.03 and COMAR 26.13.05).

- The approximate 500 cubic yards of PCB contaminated soil from the Southern Main Burn Pit would require off-site treatment or disposal if the PCB concentrations exceed 0.74 mg/kg. The PCB contaminated soil would be disposal of in accordance with all applicable regulations including the Maryland Air Quality Act (COMAR 26.11.01, COMAR 26.11.03 and COMAR 26.11.06), the Maryland Requirements for treatment and disposal (COMAR 26.13.05) and the Hazardous Materials Transportation Act (49 CFR Parts 172-179).

- Performance monitoring would be conducted to ensure that the soil is treated in accordance with the ARARs.

This alternative meets clean-up objectives to reduce exposure of human health and environmental receptors to surficial soil contamination in the source area and minimizes the potential for contaminant migration and downward leaching through these areas.

The costs for Alternative 4 are as follows:

- Capital costs: $11,089,00

- O&M costs: $O

- Net Present Worth (30 Years): $11,089,000

This alternative is expected to take eight months to implement.

2.7.1.5 Alternative 5: Removal, Off-Site Treatment, and Disposal. This alternative would involve excavation, staging, and characterization of soils in the same manner as described for Alternative 4; however, all soil excavated from the J-Field SOU would be shipped off-site for treatment and disposal. The excavated area would be backfilled with clean soil from an off-site source. Metals contaminated soil would be shipped to a RCRA Subtitle C landfill for stabilization and disposal. Similar to the procedure in Alternative 4, PCB contaminated soil would be shipped to a chemical waste landfill or a TSCA approved incinerator. Metal scrap and remediation derived waste would be disposed of in the same manner described in Alternative 2. The major components of this remedial alternative are described below.

- UXO screening and site preparation activities will be conducted prior to the initiation of any remedial actions. The UXO screening will entail screening approximately 218,000 square feet of soil in the work zone to a depth of four feet. Site preparation activities will involve the clearance of vegetative areas and construction of access roads in the area of the Northern Main Burn Pits, where remedial actions will occur. The UXO screening and site preparation activities will be conducted in accordance with the Noise Control Act, as amended the Noise Pollution and Abatement Act (42 USC 4901 et seq.) and the OSHA Standards (29 CFR 1910.95(g)).

! Excavation and transport of the soil from the J-Field SOU would be accomplished using standard earth moving equipment. After excavation, soil would be placed in trucks and transported to a temporary staging area. The soil would be temporarily stockpiled on a bermed and drained concrete or asphalt pad. The soil, covered with plastic laminate to control dust and vapor emissions, would be stored until it would be loaded into trucks and transported off-site for disposal. The contaminated soil would be excavated and temporarily stockpiled in accordance with Maryland Nonpoint Source Pollution Control Laws (COMAR 26.09.05), the Maryland Air Quality Control Act (COMAR 26.11.01), and the Maryland Requirements for Hazardous waste (COMAR 26.13.02).

! The soil excavated from the Northern and Southern Main Burn Pits that required off-site treatment or disposal would be loaded into trucks and transported off-site. The soil would be loaded, transported, and treated or disposal in accordance with all applicable regulations including the Maryland Air Quality Control Act (COMAR 26.11.01, COMAR 26.11.03, and COMAR 26.11.06), the Maryland Requirements for treatment and disposal (COMAR 26.13.05), and the Hazardous Materials Transportation Act (49 CFR Parts 172-179).

! Monitoring would be conducted to ensure that all of the contaminated soil that poses a risk to human health or the environment would be excavated and treated or disposal off-site.

This alternative meets clean-up objectives to reduce exposure of human health and environmental receptors to surficial soil contamination in the source area and minimizes the potential for contaminant migration and downward leaching through these areas.

The costs for Alternative 5 are as follows:

! Capital costs: $10,542,000

! O&M costs: $0

! Net Present Worth: $10,542,000

This alternative is expected to take four months to implement.

2.7.2 Summary of the Comparative Analysis of Alternatives

The remedial alternatives presented in Section 2.7.1 were evaluated in accordance with the regulatory requirements of CERCLA using the nine criterion specified USEPA (Table 7). This section and Table 8 summarize the relative performance of each remedial alternative with respect to seven of the nine CERCLA evaluation criteria. The State concurs with the selected alternative. The public supported the selected alternative as well, and their input is described in the Responsiveness Summary.

2.7.2.1 Threshold Criteria.

! Overall Protection of Human Health and the Environment. Four of the five treatment alternatives involve soil excavation and treatment of disposal facility to provide adequate protection of human health and the environment by reducing contaminant concentrations or eliminating potential exposure pathways. Alternatives 2, 4, and 5 (In-situ Containment and Limited Disposal; Removal followed by On-site Treatment and Limited Disposal; and Removal followed by Off-site Treatment and Disposal) offer long term protection of human health and the environment. This is achieved through removal of the contaminated soil in Alternative 4 and 5, or partial removal and isolation of the remaining soil by means of the PSB in Alternative 2. Alternative 3 (Removal and Short Term Storage) removes the soil, but stores it on-site for period of five years, making it less effective as a long term remedy. Alternative 1 (No Action) is not protective of human health and the environment even though monitoring and institutional controls are included as part of the alternative.

TABLE 7

USEPA EVALUATION CRITERIA FOR REMEDIATION ALTERNATIVES

1. Overall Protection of Human Health and the Environment addresses whether a cleanup method provides adequate protection to human health and the environment and describes how risks presented by each pathway are eliminated, Reduced, or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with ARARs addresses whether a cleanup method will meet all applicable or relevant and appropriate requirements (federal and state environmental requirements.

3. Long-Term Effectiveness and Performance is the ability of a cleanup method to maintain reliable protection of human health and the environment over time, after the action is completed.

4. Reduction of Toxicity, Mobility, or Volume Through Treatment is the anticipated ability of a cleanup method to reduce the toxicity, mobility, or volume of the hazardous substances present a the site through treatment.

5. Short-Term Effectiveness addresses the period of time needed to complete the cleanup and any adverse impacts on human health and the environment that may occur during the construction and operation period.

6. Implementability is the technical and administrative feasibility of a cleanup method, including the availability of materials and services by the method.

7. Cost includes the estimated capital and operation and maintenance costs of each cleanup method.

8. State Acceptance indicates whether the State of Maryland agrees with the preferred cleanup method.

9. Community Acceptance indicates whether concerns are addressed by the cleanup method, and whether the community has a preference for is cleanup method. Public comment is an important part of the final decision.

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- Achievement of ARARs. All of the alternatives will meet ARARs, except Alternative 1 (No Action). Each of the four remedial alternatives that involve removal and treatment or disposal of contaminated soil is capable of meeting ARARs and to be considered (TBC) requirements. The quality of nearby surface water will be protected by proper run off controls and implementation of erosion control measures in Alternative 2. The emissions of particulates during construction activities will also be minimized with appropriate engineering controls. Components of Alternatives 2, 4, and 5 will also involve the use of measures to control the moisture content of earthen materials that are removed and replaced which minimizes the amount of dust generated during remedial activities. The RCRA storage permits would be met as part of Alternative 3. For Alternatives 2, 3, 4, and 5, soils deemed hazardous by RCRA standards would be transported and disposed off-site in accordance with all RCRA, Department of Transportation (DOT) hazardous materials, and State pre-transport and transportation related requirements. In addition, PCB-contaminated soils would require management as TSCA waste.

2.7.2.2 Primary Balancing Criteria.

- Long Term Effectiveness. Alternative 3 is not considered a long term remedy because the excavated soil is stored on site for five years. Alternative 4 and 5 would provide a permanent solution and long term protection because both alternatives involve removing and treating all of the soil containing contaminant concentrations above levels that are protective of human health and the environment. Alternative 2 also provides long term protection by excavating soil with high concentrations of arsenic, lead, and PCBs and covering the remaining soil with a PSB. The PSB is constructed to further reduce potential exposure to environmental receptors, thus providing virtually the same degree of protection to human health and the environment as Alternatives 4 and 5. Alternative 2 is also consistent with any future anticipated remedial action that may occur at J-Field. Removal of the PSB can be easily accomplished and it can be used as backfill should future excavation be deemed necessary.

  Performance monitoring would be a component of each of the remedial alternatives to assure that remedial design parameters are maintained and that risk to human health and environmental receptors is reduced.

- Reduction in Toxicity, Mobility, or Volume of Contaminants. Alternatives 2, 4, and 5 reduce the contaminant toxicity and mobility in a relatively similar manner. The volume of soil required for excavation in Alternative 2 is significantly less than that in Alternatives 4 and 5; however, the in-situ containment component of Alternative 2 reduces risks to human health and the environment to the some extent as Alternatives 4 and 5. Alternative 3 does not include a treatment component so contaminant toxicity and volume would not be reduced. Alternative 1 does not reduce the toxicity, mobility, or volume of contaminated soil.

- Short Term Effectiveness. Alternative 1 has few short term effects because public access to the J-Field SOU is currently restricted and monitoring activities are currently underway Alternative 1 does not remove risks, nor does it introduce new ones. Alternatives 2, 3, 4, and 5 have the potential for increased short term effects to workers, the community, and the environment due to construction of the temporary staging areas; duct generation; exposure to potentially contaminated soil during construction, excavation, loading and transport activities; and potential encounters with UXO. Compared to Alternatives 3, 4, and 5, which have severe and long-duration adverse effects, Alternative 2 has less potential for short term effects because the amount of soil requiring excavation and disposal is significantly less. Alternative 2 would also provide the highest level of protection quickest because it involves limited removal of contaminated soil followed by isolation of remaining contaminated soil with a PSB. Alternative 3 would also involve on-site storage of soil from the J-Field SOU, therefore, creating an added increase in the potential for short term effects. In Alternatives 2-5, the potential for short term effects would be minimized through the use to protective mitigative measures and engineering controls, but the additional human health risks associated with the implementation of the alternatives and ecological damage is measurable in Alternative 2 and significant in Alternatives 3, 4, and 5. The short term effects associated with the transport of the soil would be greatest for Alternative 5 due to the increase volume of contaminated soil requiring transport off-site for treatment and disposal.

- Implementability. Each component of the five remedial alternatives can be implemented with proven technologies that have been used extensively to remediate soil at similar facilities across the country. The labor, equipment and procedures required as part of each of the remedial alternatives are readily available. As with all of the remedial alternatives, the presence of UXO may delay implementation. The soil washing/leaching treatment technology, a component of Alternative 4, has been used at several NPL and RCRA corrective action sites and would not require extensive research and development to refine the treatment technology. Alternative 4 would, however, require a pilot scale study to acquire site specific information pertaining to the use the soil washing/leaching technology at the J-Field SOU.

The implementation of Alternative 2, 3, 4, and 5 would not adversely affect the performance of any future remedial actions that might be required at the J-Field SOU.

- Cost. The costs of the different alternatives are given in Table 8. Alternative 2 is the least costly alternative which meets all ARARs and is protective of human health and the environment. Therefore, it is the most cost effective remedy. The estimated capital, O&M, and net present worth costs for the selected remedial alternative are summarized in Table 9.

2.7.2.3 Modifying Criteria.

- State Acceptance. The State concurs with the selected alternative.

- Public Acceptance. The public supported the selected alternative as well and their input is described in the Responsiveness Summary.

2.7.3 Selected Remedy

The selected remedy to clean up soil contamination at the J-Field SOU is Alternative 2. In-Situ Containment and Limited Disposal, using soil clean-up objectives of 1000 mg/kg for lead, 328 mg/kg for arsenic and 25 mg/kg for PCB. Alternative 2 is highly protective of human health and the environment: complies with all ARARs; has a high level of long term effectiveness and permanence; reduces the toxicity, mobility, and volume of contamination; has a high level of short term effectiveness; is expected to be easily implementable; and is relatively cost-effective. Alternative 2 provides the best balance of features in that a minimal amount of soil is excavated that requires off site disposal, yet the placement of the PSB reduces risk to human health and the environment to the same extent as Alternatives 4 and 5. The construction of the PSB reduces the risk to the environment without requiring excavation of an additional 14,00 cubic yards of soil. As part of Alternative 2 erosion control features will be constructed along the Chesapeake Bay shoreline (Figure 4). While the erosion of the shoreline does not pose an imminent treat from contaminated areas of J-Field, by combining this action with the J-Field SOU remedial action the erosion threat is reduced and the natural resources are preserved.

TABLE 9

COST ESTIMATE FOR ALTERNATIVE 2 IN APRIL 1996 DOLLARS

| Activity | Cost ($ 1,000) Subcontract and Other Direct Costs | Contractor Unloaded |
|---|---|---|
| Direct costs | | |
| Repair resurface existing road | | 40 |
| UXO screening | 70 | |
| Clear and Grub | 15 | |
| Excavate/drum/stage soil (PCB) | 1.4 | 12.6 |
| Excavate/drum/stage soil (metals) | 5.5 | 49.5 |
| Off-site disposal, soil (PCB) | 30 | |
| Off-site disposal, soil (metals) | 739.5 | |
| Off-site disposal, remediation-derived waste | 20 | |
| Sampling and analysis | 20 | |
| Landscape excavated area | 6 | 8 |
| Install 2-ft earth cover | 332 | 17.5 |
| Site stakeout and control | | 16 |
| Sediment control plans and specs | | 5 |
| Perimeter dike with flood protection | 46 | 17 |
| Remedial action professional labor | | 34 |
| Remedial design | 60 | |
| Shoreline stabilization | 73.4 | 45.6 |
| Contractor general conditionsa | | 125 |
| 30-year operation and maintenance | 50 | |
| Contractor unloaded costa | | 445 |
| Contractor loaded costa | 1394 | |
| Indirect costs | | |
| Contractor unloaded and overhead | | 779 |
| Contractor subtotal cost | | 2173 |
| Fee (8%) | | 174 |
| Total contractor cost | | 2347 |
| Other | | |
| Contingencies (10%) | | 235 |
| Project management (8%) | | 188 |
| Total project cost | | 2769 |

a Loaded costs = subcontract and other direct costs; unloaded = contractor costs, less overhead.

b For this estimate, ICF Kaiser Engineers, Inc., included contractor general conditions under direct costs.

The costs for Alternative 2 are summarized in Table 9.

The goal of this remedial action is to reduce the potential for adverse effects to human health and the environment. Based on information obtained during the RI and on a careful analysis of all remedial alternatives it is believed that the selected remedy will achieve this goal.

The estimated net present worth of Alternative 2 is $2,769,000. The estimated time to implement this alternative is three months.

2.7.4 Statutory Determinations

The selected remedy discussed in Section 2.7.3 satisfies the requirements under Section 121 of CERCLA to:

! Protect human health and the environment;

! Comply with ARARs;

! Be cost-effective; and

! Utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

2.7.4.1 Protection of Human Health and the Environment. The selected remedy, Alternative 2 will reduce potential risks to human health and the environment that are currently being posed resulting from contaminants in the soil at the J-Field SOU. The remedial alternative involves the excavation and off-site treatment or disposal of soil containing elevated levels of lead, arsenic, and PCB followed by construction of a PSB. Once the PSB has been constructed, no adverse effects are anticipated to develop in humans, animals, or vegetation as a result of the J-Field SOU. The estimated time required to implement this alternative is three months, assuming unforeseen delays due to the presence of UXO do not develop. The adverse short term effects associated with this alternative will be minimized to the maximum extent practical through the use of protective mitigative measures and engineering controls. These measures include UXO clearance, sediment and erosion control, control of stormwater runoff, noise control, dust controls, and spill response plans. Performance monitoring will be conducted to assure that the remedial measures are conducted and maintained in a manner protective of human health and the environment.

2.7.4.2 Compliance with ARARs. The selected remedy will comply with all chemical, location, and action specific ARARs. The UXO screening, site preparation, excavation, off-site transport and treatment or disposal, and construction and maintenance of the PSB will be conducted with appropriate engineering controls to minimize the release of pollutants to air, land, or water. The remedy will be conducted in accordance with the ARARs presented in Section 2.7.1.2 and below.

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! Chemical Specific ARARs

- The TSCA (15 U.S. Code 2605(e)).

- The Federal Regulation 40 CFR, Part 761.125(3)(v).

- The Federal and State Requirements pertaining to the use and management of containers (40 CFR, Part 264, Subpart I, and COMAR 26.13.05.09) (applicable).

- The Solid Waste Disposal Act, as amended (42 USC 6921)

- The Federal Requirements pertaining to waste characterization (40 CFR, Part 261, Subparts C and D) (applicable).

- Maryland standards concerning defining a hazardous waste (COMAR 26.13.02) (applicable).

- Maryland Air Quality Regulations (COMAR 26.11.01 - 26.11.02) that apply to general or toxic process emissions and construction activities which generate particulates (applicable).

! Location Specific ARARs

- Chesapeake Bay Critical Area Protection Program (NR 8-1801 et. seq. and COMAR 27) to protect the Bay and criteria for development in the Bay area (applicable).

! Action Specific ARARs

- Maryland Non-Point Pollution Control Laws (Section 4-101) apply for any construction activities including soil movement, grading, transporting, or otherwise disturbing land (applicable).

- Maryland Nontide Wetlands Regulations (COMAR 08.05.04), apply to any excavation, dredging, or dumping of soil nontidal wetland area (applicable).

- Maryland Transportation and Disposal Standards (COMAR 26.13.03 and 26.13.04) which apply to off-site shipment of contaminated material (applicable).

- Maryland Landfill Standards (COMAR 26.13.05) which apply to disposal of material (applicable).

- Endangered Species Act (16 USC 1531-1543, 50 CFR 17.402, 40 CFR 6.302 (h)) (applicable).

- Bald and Golden Eagle Protection (16 USC 668-668d) which apply if any remedial activities would disturb the habitat of the Bald Eagle (applicable).

- Floodplain Management (EO 11988, 40 CFR, Part 6) would apply because the site is within the 100 year floodplain (applicable).

- Protection of Wetlands (EO 11990, 40 CFR, Part 6) would apply because wetlands exist in the area (applicable).

- Noise Control Act, as amended the Noise Pollution and Abatement Act (42 USC 4909) would apply because heavy equipment will be used (applicable).

- OSHA Standards (29 CFR 1910) must be followed during all remedial activities (applicable).

2.7.4.3 Cost-effectiveness. The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its cost (the net present worth is $2,769,000). Of the five remedial action alternatives, the selected remedy is more cost-effective than the other alternatives. The selected alternative provides the best balance of features that offer overall protection to human health and the environment.

2.7.4.4 Utilization of Permanent Solutions to the Maximum Extent Practicable. The selected alternative reduces the toxicity, mobility, and volume of contaminants because contaminated soil would be excavated and a PSB would be constructed to further minimize the potential risks to human health and the environment.

2.7.4.5 Preference for Treatment as a Principal Element. The statutory preference for treatment or resource recovery is satisfied by using the selected alternative because the principal element of the remedial technology is to permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances.

## 2.8 DOCUMENTATION OF SIGNIFICANT CHANGES

The following changes have occurred since the publication of the Proposed Plan. The arsenic clean-up level of 328 mg/kg is less than the concentration associated with a 1x10-4 cancer risk level for worker exposures (i.e., 380 mg/kg). The clean-up level is also significantly lower than the noncarcinogenic protective concentration for worker exposures (i.e., 610 mg/kg). Therefore, it would be appropriate to use the 328 mg/kg concentration as a clean-up level, since it is within the acceptable risk range of 1x10-6 to 1x10-4 for health protectiveness at Superfund Sites and much lower than the level that could be associated with adverse noncarcinogenic effects to workers.

The PCB clean-up level has been adjusted to 25 mg/kg. That standard is the clean-up level designated by 40 CFR 761.125(3)(v) for PCB spills in restricted areas.

The name of the Area addressed by this remedial action has been changed from the Former Toxic Burn Pits to the J-Field Soil Operable Unit. This was done for clarification. The SOU consists of two main burn pits (the Northern Main Burn Pit and Southern Main Burn Pit). It also includes the Pushout Area, which consists of the VX Burn Pit, the Mustard Burn Pit, and the Liquid Smoke Disposal Pit.

The additional excavation of lead in the Pushout Area has been added since the Proposed Plan was published. This action was added as a further measure to reduce risks to human health and the environment. Lead will be excavated to levels below 1,000 mg/kg which is generally accepted as the industrial screening level.

## 2.9 SUMMARY OF PERFORMANCE STANDARDS

- Excavation in the Northern Main Burn Pit and Pushout Area will remove lead to levels below the industrial screening level of 1000 mg/kg, which is a reasonable level used to determine the potential for adverse effects to industrial workers.

- Excavation in the Northern Main Burn Pits will remove arsenic contamination above 328 mg/kg, which is a level protective of human health risk greater than 1x10-4.

- The depth of excavation in the Northern and Southern Main Pits will not be less than 2 feet in any area.

- PCBs in Southern Main Burn Pit will be excavated to below 25 mg/kg.

- The PSB, covering the Northern and Southern Main Burn Pits and the Pushout Area will be a minimum of 2 feet thick in all places.

- The PSB will be underlain by geotextile membrane which separates the unexcavated soil from the clean backfill of the PSB.

- The construction of the PSB will contain a barrier designed to prevent encroachment of burrowing animals.

- Shoreline protection will be constructed along the J-Field, Chesapeake Bay boundary as part of this interim action.

- The PSB will be engineered to include an earthen to significantly reduce surface runoff from the J-Field SOU toward the marsh.

- The excavated area will be backfilled with clean soil from an off-site source. Metals contaminated soil will be shipped to a RCRA Subtitle C landfill for stabilization and disposal. PCB contaminated soil will be shipped to a chemical waste landfill if under 50 mg/kg or a TSCA approved incinerator if over 50 mg/kg. Metal scrap and remediation derived waste will be decontaminated and stored for recycling by the Defense Reutilization and Management Office, or disposed off site at an appropriate landfill.

- The PSB will be monitored in accordance with an approved O&M Plan.

## 3.0 RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary. The Responsiveness Summary provides a summary of the public's comments, concerns, and questions about the former burn pits at APG's J-Field Study Area and the Army's responses to these concerns.

During the public comment period, written comments, concerns and questions were received by APG.

APG held a public meeting on August 12, 1996, to present the Proposed Plan, to answer questions, and to receive comments. The transcript of this meeting is part of the administrative record for the site. All comments and concerns summarized below have been considered by the Army and EPA in selecting the final clean-up methods for the J-Field Study Area SOU.

This responsiveness summary is divided into the following sections:

3.1 Overview.
3.2 Background on community involvement.
3.3 Summary of comments received during public comment period and APG's responses.
3.4 Sample newspaper notice announcing public comment period and the public meeting.

## 3.1 OVERVIEW

At the time of the public comment period, the Army had endorsed a preferred alternative for the clean up of the J-Field SOU. APG's selected alternative was In-Situ Containment and Limited Disposal which includes excavation and off-site treatment of the soil, as well as placement of a PSB over the area. The Maryland Department of the Environment concurred with the selected Alternative.

The community generally agrees with the selected alternative of In-Situ Containment and Limited Disposal. Several commenters expressed a preference for Alternatives 4 or 5 as they believed Alternative 2 was chosen because of cost. They were concerned that Alternative 2 would not be fully protective of the community. APG has addressed these concerns in the following section. A community group Aberdeen Proving Ground Superfund Citizens Coalition (APGSCC), has stated that it could not support the Proposed Plan until they received additional information on issues such as the amount of the soil to be excavated, clean-up levels and the long-term monitoring plan. These concerns and APG's responses are further discussed in the following section.

## 3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

Community participation in the J-Field SOU remedial action has been fairly low. J-Field does not directly border residential areas, which may account for relative lack of concern residents have had with J-Field. Recreational users of the adjacent waterways are interested in potential impacts J-Field might have on the surface waters of the Bush and Gunpowder Rivers and Chesapeake Bay.

APG has been keeping the community informed about the Remedial Investigation of J-Field and the Focused Feasibility Study for the J-Field SOU through monthly Restoration Advisory Board meetings, meetings with APGSCC, fact sheets, newsletters, community meetings, and personal discussions.

APG's community relations activities for the release of the J-Field SOU Proposed Plan included the following:

! APG released the Proposed Plan for the J-Field SOU for public comment on July 10, 1996. Copies were made available to the public at APG's information repositories at the Aberdeen and Edgewood Branches of Harford County Library, Miller Library at Washington College, and the Baltimore County Department of Environmental Protection in Towson, MD.

! APG issued a press release announcing the availability of the Proposed Plan, the dates of the public comment period, and the date and time of the public meeting to APG's full media list.

! A 45-day public comment period on the Proposed Plan ran from July 15 to August 23. Upon a request from a citizens group, APGSCC, the comment period was extended an additional 15 days to September 6, 1996.

! APG placed newspaper advertisements announcing the public comment period and meeting in The Aegis, the Cecil Whig, The Avenue, the Kent County News, and the Bay News.

! APG prepared and published a fact sheet on the Proposed Plan. APG mailed copies of this fact sheet to over 2,500 citizens and elected officials on its Installation Restoration Program mailing list. The fact sheet included a form which citizens could use to send APG their comments.

! The APG News featured a story on the Proposed Plan in the July 24, 1996 edition and ran reminder notices about the public meeting in later issues.

! On August 12, 1996 APG held a public meeting at the Edgewood Senior Center. Representatives of the Army, USPEA, and MDE were available to answer questions about the proposed remedial alternatives under consideration.

## 3.3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Comments raised during the J-Field public comments period on the Focused Feasibility Study and the Proposed Plan are summarized below. The comments are categorized by topic and by source.

As part of its fact sheet on the Proposed Plan, APG included a form that residents could return with their comments. Of the 2,500 mailed fact sheets and those available at the public meetings and repositories, APG received 27 complete comments forms.

Responses on the completed returns were:

| | | |
|---|---|---|
| 1 | Alternative 1: | Take no action |
| 14 | Alternative 2: | Limited removal, off-site treatment, and in-place containment |
| 1 | Alternative 3: | Removal and short-term storage |
| 5 | Alternative 4: | Removal, on-site treatment, and limited off-site disposal |
| 5 | Alternative 5: | Removal, off-site treatment, and disposal |
| 1 | Have no preference | |

The following comments were included on the forms returned:

Comment 1: I was wondering if concrete could be used in this procedure around the edges and put holes (small) in it. I know it would be impossible to excavate all of the contaminated soil because some of that stuff has been there for forty years or more.

Response: It is possible to put some type of physical control measure around the soil. We are evaluating different possibilities, such as rip rap (large rocks) which would prevent further erosion of the soil. During the next phase of the clean-up process, the design stage, we will decide which measure we will use. We will send a fact sheet to the public outlining the final approved design.

Comment 2: Your fact sheet, July 96, is presented in excellent form--without bureaucratic, confusing English. Your logical, simple approach to problem solving is outstanding. Thanks for an excellent job.

Response: APG acknowledges and appreciates the feedback.

Comment 3: Several commenters stated that Alternative 2 seemed like a good choice financially but wanted to be sure it was fully protective of the public. Several commenters preferred Alternatives 4 and 5 because they felt cost was being given a higher priority than community welfare in Alternative 2.

Response: The USEPA mandates that Overall Protection of Human Health and the Environment be the top priority in evaluating remedial action alternatives. Cost, the seventh criterion designated by the USEPA, is considered only after the previous six, which include protectiveness of human health and the environment, long and short term effectiveness, and reduction of toxicity, mobility, and volume of contaminants. Alternative 2 is fully protective of human health and the environment.

Comment 4: Is there possibility of placing collection stations on telephone poles that would collect air samples in the community over set intervals? This way the community could see a monitoring system in effect. There seems to be a lot of respiratory ailments recently in our community.

Response: The Risk Assessment did not indicate a need for any action due to chemical releases to the air at J-Field. APG conducts air monitoring at locations where there are known sources. In addition, during sampling and field work as part of the clean-up program APG conducts monitoring at work site. If there were any unsafe level of substances in the air which could move into the community, they would be detected first at the work site. Air monitoring technology is constantly being improved. APG plans to continue to review developing technology and improve its air monitoring capabilities wherever possible.

Comment 5: In alternatives four and five the same amount of soil (16,000 cu. yds.) are removed and yet by your analysis alternative five is less effective in overall protection and reduction of toxicity, mobility and volume--why?

Response: Alternative 4 is more protective of human health and the environment and Alternative 5 because it treats the contamination on-site. Alternative 5 introduces new potential exposure pathways in that it requires the transportation of large amounts of contaminated soil off-site. In our analysis of reduction in contaminant toxicity, mobility, and volume, we rated Alternative 4 higher because the soil is actually cleaned, thereby reducing the overall volume of contamination. In Alternative 5, the soil is just moved to an off-site facility, and there is no reduction in the volume of contamination.

Comment 6: I prefer #3: Treatment technology in five years should be more cost-effective and this approach seems to be more thorough in totally cleaning the area.

Response: Alternative 3 is less protective of human health and the environment than Alternative 2 and 4. In addition, it is not competitive with Alternatives 2, 4, or 5 in its long-term effectiveness. Finally, there is on guarantee that alternative methods of treatment will be available or more cost effective in 5 years.

Comment 7: One commenter expressed a preference for Alternative 4 and included the following comment. Become a leader in waste treatment. An on-site facility provides capability for past, present and future use as a treatment for APG as well as other areas around the county which need to be cleaned up. The on-site facility would generate job opportunities for the area.

Response: The soil washing facility referred to in Alternative 4 would be designed specifically to treat the soil from the J-Field SOU. To construct a facility that could treat soil from areas outside of APG is beyond the scope of APG's clean-up program and would require an extensive regulatory and public review process to include the obtaining of various permits. APG is using innovative technology and sharing information wherever and whenever possible.

Comment 8: Only choice #2 includes erosion control. Why was this not include w/choices 3 thru 5. Erosion control in that area would be required no matter what choice was made as you are stripping the topsoil and soil-retaining vegetation.

Response: Under Alternatives 3, 4, and 5, all the contaminated soil would be excavated. The area would then be backfilled and vegetation restored, thus eliminating the need for erosion control to prevent any contaminated soil from leaving the site. Clean-up funds could not be used to prevent naturally occurring erosion unless the erosion presented a possible threat to human health or the environment. Under Alternative 2, some soil containing metals would remain at the site, therefore making erosion protection necessary.

Comment 9: Is any work being done on on-site decontamination through chemical or bacteriological methods?

Response: APG is investigating several of these technologies. In addition, APG uses information provided by USEPA, by consultants who perform work throughout the United States and internationally, and through technical symposiums where information is exchanged.

Comment 10: Please let us know date of removal.

Response: APG will continue to keep the public informed as work continues on this project through meetings and newsletters.

Comment 11: A commenter expressed a preference for alternative 1 (take no action) and included the following comment. I believe in taking action where action is warranted. However, based on the health RA, potential exposure to humans and the environment is limited. Do a cost/benefit analysis on this site, and tell me how you can spend $2 million cleaning up a site that has an extremely low chance of making people and animals sick. Doing nothing is at least 15 times cheaper than any clean-up option. And that is based on a 30 year cost to maintain the area. The real (annual) cost is more than $5,000 a year if I understand the information correctly. Let's use some common sense here. Is it a problem? Probably not. Why clean it up? The decision matrix is nice to help demonstrate alternatives, but it should take into account the degree of the problem. If you look at the impact of the alternatives, I believe you will see very little benefit.

Response: APG agrees that the RA showed only a very low potential for risk to human health. This potential risk of exposure to the soil was to demolition workers, and the risk could be controlled by limiting access and by wearing protective clothing. Taking action would have a beneficial ecological impact, as the Ecological RA highlighted environmental ramifications of the existing soil contamination at J-Field. In addition, preventing contaminants from future migration is a concern of APG. APG agrees with the need to use taxpayers' money and effectively and attempts to propose solutions which are protective of human health and the environment and are the most cost-effective solutions among equal methods.

Comment 12: Alternative 2 seems the obvious solution--both from the view of practically and cost containment. I appreciate your efforts in the restoration program and in keeping the public informed.

Response: APG acknowledges and appreciates the feedback.

APG received the following verbal and written comments from the Aberdeen Proving Ground Superfund Citizens Coalition (APGSCC) at the public meeting on August 12.

Comment 13: APGSCC would like further information about the arsenic and PCB clean-up levels and about whether the soil containing high levels of lead will be removed.

Response: The final clean-up levels agreed upon by APG, MDE, and the USEPA are as follows:

1,000 mg/kg for lead - the generally accepted industrial screening level
328 mg/kg for arsenic - This level is protective of human health risk greater than 1x10-4
25 mg/kg for PCBs - the restricted access clean-up standard designated in TSCA

Comment 14: APGSCC stated they had submitted comments on the two drafts of the Focused Feasibility Study for J-Field. Volume I of the Remedial Investigation, the Ecological RA, and the draft proposed plan. APGSCC stated that concerns raised in their comments have not been addressed.

Response: APG believes it is important to involve the community throughout the clean-up process not just at the decision stage. Therefore, APG makes drafts of documents available to APGSCC, other members of the Restoration Advisory Board, and to the public at its information repositories. APG reviews and considers all comments its receives. If appropriate. APG incorporates changes into the final version of the document. Other comments may relate to future documents and plans, and APG retains these comments for use at that time. APG has prepared specific responses to APGSCC's comments and has sent them to APGSCC; copies will be placed in APG's information repositories. With regard to the draft Proposed Plan. APG did receive and address APGSCC's comments.

Comment 15: APGSCC stated that it had not been presented with information regarding long-term monitoring plans.

Response: The development of long-term monitoring plans are part of the next phase of the clean-up process as mandated by environmental laws. After the ROD is signed, APG will develop the remedial design plans which include the long-term monitoring plan. APG will make copies of the draft design plans available for public review.

Comment: APGSCC asked about the remediation of the burn pits while another section of J-Field is still an active emergency demolition area.

Response: APG conducts emergency detonations at a portion of J-Field under a RCRA interim status permit from the USEPA. The detonations are not conducted close enough to the burn pits to have an impact on any remediation actions at the Former Toxic Burn Pits (FTBP) Area.

Comment 17: APGSCC asked about whether any action is being taken at the marsh as part of this proposed plan or if action will be taken in the future.

Response: As part of Alternative 2, APG will take action to prevent further erosion of the marsh area Ecologists who have studied the marsh advised APG that the substances found in the sediment marsh pose no risk to human and only a very minor ecological risk. Attempts at cleaning up and restoring marshes in different parts of the country have not been very successful. Scientists believe that disturbing the marsh with any type of clean-up effort now may do more harm than good. APG plans to continue to monitor the marsh and evaluate the need for action in the future.

## 4.0 REFERENCES


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LIST OF ACRONYMS

ADD))Applied Daily Doses
APG))Aberdeen Proving Ground
APGSCC))Aberdeen Proving Ground Superfund Citizen's Coalition
ARAR))Applicable or Relevant and Appropriate Requirements
CERCLA))Comprehensive Environmental Response, Compensation, and Liability Act
COMAR))Code of Maryland Regulations
COPC))Chemical of Potential Concern
CPF))Cancer Potency Factors
CSF))Cancer Slope Factors
DOT))Department of Transportation
EEQ))Environmental Effects Quotient
FFA))Federal Facility Agreement
FFS))Focused Feasibility Study
FTBP))Former Toxic Burn Pits
HI))Hazard Index
HQ))Hazard Quotient
MDE))Maryland Department of Environment
NCP))National Oil and Hazardous Substances Pollution Contingency Plan
NEPA))National Environmental Policy Act
NPL))National Priorities List
O&M))Occupational Safety and Health Administration
OU))Operable Unit
PCB))Polychlorinated biphenyl
PSB))Protective Soil Blanket
RAO))Remedial Action Objectives
RA))Risk Assessment
RBC))Risk Based Concentration
RCRA))Resource Conservation and Recovery Act
RFA))RCRA Facility Assessment
RfD))Reference Doses
RI/RS))Remedial Investigation/Feasibility Study
RME))Reasonable Maximum Exposure
ROD))Record of Decision
SARA))Superfund Amendments and Reauthorization Act
SOU))Soil Operable Unit
SVOC))Semivolatile Organic Compounds
SWMU))Solid Waste Management Units
TBC))to be considered
TCLP))Toxicity Characteristic Leaching Procedure
TECOM))Test and Evaluation Command
TPH))Total Petroleum hydrocarbon
TSCA))Toxic Substances Control Act
UCL))Upper Confidence Limit
USACHPPM))U.S. Army Center for Health Promotion and Preventive Medicine
USAEC))U.S. Army Environmental Center
USEPA))U.S. Environmental Protection Agency
USGS))U.S. Geological Survey
UXO))Unexploded Ordnance
VOC))Volatile Organic Compound
VX))O-ethyl-S(2-iisopropylaminoethyl)methyl phosphonothiolate